Socialising the automation of flexible residential energy use

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Socialising the automation of flexible residential energy use

Conference session report

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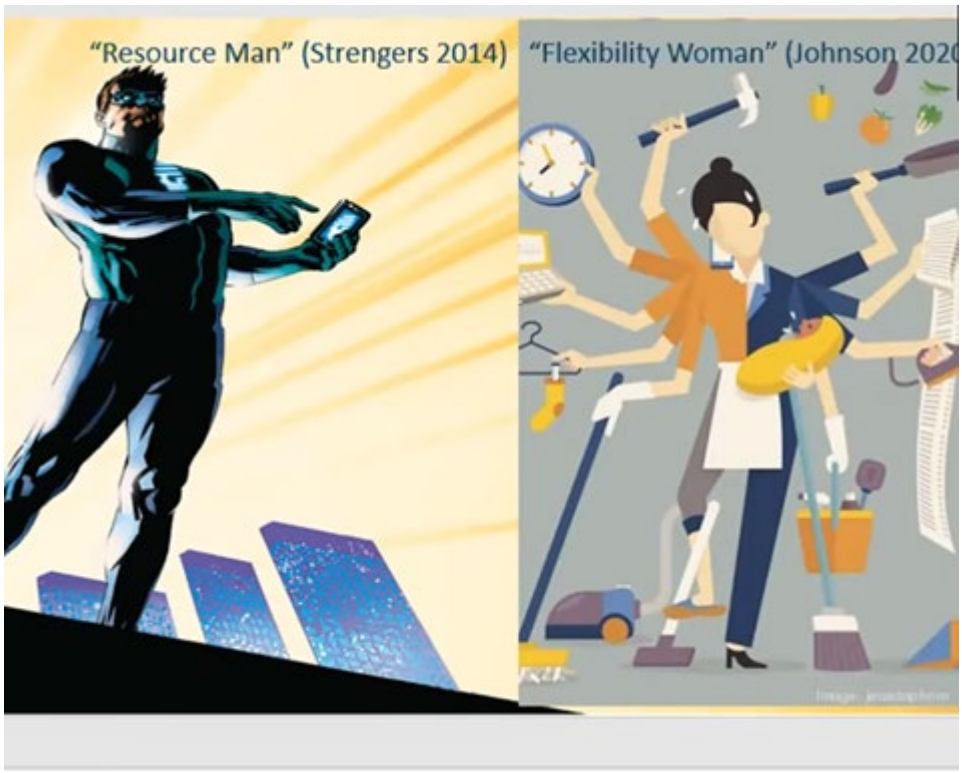
As renewable energy generation becomes more integrated and embedded in communities, users are increasingly called upon to participate in the active planning, ownership and management of smart energy systems. A key vector of this participation is the automation of home batteries and of significant loads such as air conditioners, heat pumps, water boilers and electric vehicles, which is seen as essential to relieve pressure on the grid during high-demand events such as evening peaks and particularly hot or cold weather. Automation and digitalisation are also facilitating the emergence of new 'energy communities' and peer-to-peer trading of energy generated by prosumers at distributed sites. In this session we ask: How are residential energy users and prosumers imagined by incumbent energy providers, policy makers and regulators as agents of automation? What new valuations of the forms of energy use that inhibit or support load flexibility are being created through markets, regulations, technology and policy? How is automation invoking new collectives, as well as reconfiguring and diminishing current ones? What does automation mean for the increasing focus on empowering citizens and 'energy communities' in Europe and other parts of the world? In posing these questions we seek to move energy planning discourses beyond the terrain of atomistic economic actors operating within markets by insisting on the socio-technical character of energy systems and mapping indiscernible actors in these automated systems.

The session included four papers:

'Fair flexibility? Capabilities and framings of end-user flexibility in the electricity grid', Ingvild Firman Fjellså, Antti Silvast, Tomas Moe Skjølsvold, NTNU

Fjellså presented some findings based on an article with Silvast and Skjølsvold currently in review, discussing the views and expectations of household energy demand flexibility held by system developers and householders themselves. In interviews system developers were generally positive about the potential for increased flexibility and focused on key levers to 'activate' flexibility (information, automation and pricing schemes), evoking a rational consumer or 'Resource Man' (Strengers 2014). Householders, on the other hand, revealed in interviews that they have different and conflicting interests in undertaking the practical labour required to facilitate flexibility, or what Fjellså and colleagues call 'flexibility work'. Flexibility work tends to take four forms: cutting/moving demand, using a system already

installed in house (smart devices and appliances), installing new systems, and outsourcing management. They use the concept of 'flexibility capital' – defined by Powells and Fell (2019) as "the capacity to responsively change patterns of interaction with a system to support the operation of that system" – to show that some of these forms of flexibility work are associated with higher levels of capital (e.g. installing new energy management systems) than others (e.g. cutting/moving demand) and that this capital is not even distributed among householders. They juxtaposed the concept of 'Flexibility Woman' (Johnson 2020) with that of 'Resource Man' to highlight the value of an energy justice perspective and to raise the concern that mechanisms of flexibility, far from being neutral, could add to the individualisation of what is a structural problem.



'Smart charging infrastructures and the different types of end-user', Ida Marie Henriksen, Marianne Ryghaug, Tomas Moe Skjølsvold, NTNU

On the basis of an empirical study of shared garages and smart charging in Norway, Henriksen and colleagues analysed how this emerging technology is currently being rolled out and socialized in residential buildings. They explore different types of end users.

The practical end-user views smart charging as the most cost-efficient solution to the problem of EV charging in a shared garage, while for the playful end-user the motivation lies in the joy of setting up the smart home and benefits for the electricity grid are merely side effects. The unintended flexible end-user, in their role as e.g. housing board leader, identifies smart charging as the solution to a pressing problem even if they may not fully understand it. The unflexible end user, seeing smart home technologies as uninteresting or too

complicated, and not motivated by price signals or environmental arguments relating to the grid (although possibly viewing the increasing use of technology in everyday life as part of a broader environmental problem), avoids smart charging. Through this framework, Henriksen and colleagues draw attention to how demand for EV smart charging emerges from specific social dynamics and contexts characterised by different levels of need and interest. They point to how these ideal types connect to salient controversies around flexibility issues and the acceptability of automation in this area, as well as to the ways in which automation invokes new collectives that might both empower and disempower citizens.

'Smart home technology and automated agency in changing everyday practices', Line Kryger Aargaard, Aalborg University

Aagaard presented early observations from a project that explores how the role of dynamic non-humans can be conceptualised from a practice theoretical perspective in the study of smart home technology, and in this paper focusses on how – following STS scholar Akrich (1992) – these technologies come to be 'scripted' through the practices of the professionals engaged in developing them. She described the vision of smart home technologies articulated in interviews with these technology developers as centred on convenience and interoperability. She argued that smart home technology development is best understood as a landscape of diffuse and specialised actors and locations in which different roles and skills are brought together around collective visions. The development of such technology does not take a linear course but comes about through a lot of processes, negotiations and partnerships that are mutually dependent, meaning that scripting must be seen not as something that happens in one place or by one actor, but as the effect of an entanglement of visions and practices.

'A social license to automate electricity loads?', Declan Kuch, Western Sydney University, and Sophie Adams, University of New South Wales

In this paper Kuch and Adams introduced the 'Social License to Automate' Annex of the User-Centred Energy Systems Technology Collaboration Programme (Users TCP) – only one of 38 TCPs with a social scientific focus – within the framework of the International Energy Agency. The 'social license' concept was adopted following observations of the community backlash against wind farm projects as a way to frame the study of what is required to build and maintain acceptance of and trust in automation in demand side management initiatives. Kuch and Adams presented initial findings from a case study within this research programme on household solar owners' perspectives on participation in a battery virtual power plant (VPP). They describe how VPP participation does not obviously align with, and indeed may conflict with, the reasons that people choose to purchase a battery (which include energy independence, convenience and environmental concerns), and suggest that Participation in a VPP would require a significant conceptual shift for some people who think of themselves as being on a sustainable energy path towards greater energy efficiency and self-consumption.

The discussion identified and further explored the following themes across the four papers:

Flexibility as an uneven capacity across households and society

- Achieving flexibility involves work (including time, energy and other resources)

- The promise of automation, as one of the means of achieving flexibility, is to relieve householders of their housework. This may be realised to a point, however, it also introduces new burdens. There is a tension between the ideals of automation making life easier on the one hand, and creating more work on the other
- The concept of 'flexibility capital' (Powells and Fell 2019) is particularly useful for illuminating how the resources and capacity necessary to undertake flexibility work – including to outsource it via automation – are unevenly distributed in society

The disjuncture between designer expectation and user realities

- There is a gap between designer/industry visions and people's everyday lives. This is evident in the papers by Fjellså and colleagues, which shows that people do not always have the means to deliver the flexibility that the industry expects, and by Henriksen and colleagues, which shows that the uptake of smart energy management technologies varies according to a combination of contextually specific perceived needs and interests.
- Susan Leigh Star's concept of 'boundary object' may be useful to think about how the device itself functions as an interface between the practices, values, meanings, etc, of the technologist as well as those of the user.

(Re)making the user: Changing energy and environmental subjectivities

- The discussion pointed to the need to interrogate the visions of the user – not only those of device designers but also those of policy-makers – and ask *who* these systems are being designed for and who is excluded.
- Two of the papers suggested that what it means to be environmentally minded in any given context can vary. Henriksen and colleagues mentioned that the 'unflexible end-user' is unswayed by environmental arguments relating the grid but may maintain that environmental commitments preclude buying more technologies that consume energy. Kuch and Adams described how many informants in their VPP study were motivated by an environmental commitment to maximise self-consumption of their household solar energy, and struggled to understand or reconcile the less direct environmental benefits of participation in a VPP.
- The discussion also covered EU legislation around energy citizenship and renewable energy communities, which are legal entities which carry weight. Engineers and economists have key roles in shaping smart energy technologies and they are interested primarily in the individual consumers and tend to leave the social out of the picture. This clashes with the ways in which users' participation in the energy system is increasingly being understood and enacted in the social scientific and political spheres through community.

The individual and the community

- These papers point to the potential for community to emerge around the technology. The examples of smart charging in Norway discussed by Henriksen and colleagues can be seen as instances of the formatting and shaping of a kind of community around the housing board and its members, even if a relatively incidental community.

- By refusing to take community as an already given entity, and instead viewing it as shaped by the visions and work of technologists, policy-makers, and users, STS can contribute to understanding how communities come about and shape the interpretation and institutionalisation of these concepts. These papers indicate that automated DSM can be more individualising or more orientated to community, and that this depends on the specific case.
- What is more, there is often a tension within these initiatives between individual and community benefits, as shown in the VPP case in the paper by Kuch and Adams.
- The boundaries that define these communities are negotiated and can change with the different values and meanings captured in the initiative, as again shown in the paper by Kuch and Adams, in which informants preferred scale of the VPP shifted with different perspectives on its objectives and benefits.
- We discussed the scope for building community around energy technologies given the diversity of end-users, as revealed in these papers. It seems however, that communities tend to form around other values, which technologies then interact with in one way or other.
- In exploring the concept of community, STS scholars must be aware of the potentially negative side of community, as documented for example in work by Janet Stephenson in New Zealand, which underlines that community necessarily entails a demarcation of inside and outside that can in turn lead to marginalisation and alienation. For example, NTNU research shows that island tariff schemes can benefit holiday home owners at the expense of permanent residents.
- ·We must therefore question whether it would be just for communities to claim a role of participating in these automated DSM initiatives given that not everyone has the capacity to participate as a community member – as the ‘flexibility capital’ concept underlines.
- We shouldn’t lose sight of the fact that the electricity grid is wonderful social system that delivers a public good in the way we look at these new initiatives – including those that delineate and target particular groups within the energy system as a particular community of one kind or another. That said, we must also be wary of the idea of ‘the commons’, which is in fact proprietary in its foundations.